



Atty. Dkt. No. 047182-0145

IFW

**THE UNITED STATES PATENT AND TRADEMARK OFFICE**

Applicant: Nikhil KORATKAR et al.

Title: MINIATURIZED GAS SENSORS FEATURING  
ELECTRICAL BREAKDOWN IN THE VICINITY OF  
CARBON NANOTUBE TIPS

Appl. No.: 10/540,112

International Filing Date: 12/19/2003  
371(c) Date:

Examiner: Unassigned

Art Unit: 1753

Conf. No.: 1425

**INFORMATION DISCLOSURE STATEMENT**  
**UNDER 37 CFR §1.56**

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

Submitted herewith on Form PTO/SB/08 is a listing of documents known to Applicants in order to comply with Applicants' duty of disclosure pursuant to 37 CFR §1.56.

A copy of each non-patent document is being submitted to comply with the provisions of 37 CFR §1.97 and §1.98.

The submission of any document herewith, which is not a statutory bar, is not intended as an admission that such document constitutes prior art against the claims of the present application or that such document is considered material to patentability as defined in 37 CFR §1.56(b). Applicants do not waive any rights to take any action which would be appropriate to antedate or otherwise remove as a competent reference any document which is determined to be a *prima facie* art reference against the claims of the present application.

**TIMING OF THE DISCLOSURE**

The listed documents are being submitted in compliance with 37 CFR §1.97(b), before the mailing date of the first Office Action on the merits.

**RELEVANCE OF EACH DOCUMENT**

An English translation of the foreign-language document is not readily available. However, the absence of such translation does not relieve the PTO from its duty to consider the submitted foreign language document (37 CFR §1.98 and MPEP §609).

Applicants respectfully request that each listed document be considered by the Examiner and be made of record in the present application and that an initialed copy of Form PTO/SB/08 be returned in accordance with MPEP §609.

Although Applicant believes that no fee is required for this Request, the Commissioner is hereby authorized to charge any additional fees which may be required for this Request to Deposit Account No. 19-0741.

Respectfully submitted,

Date 12/18/06

By 

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Attorney for Applicant  
Registration No. 43,445

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Substitute for form 1449/PTO <b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b> Date Submitted: December 18, 2006 (use as many sheets as necessary)		<b>Complete if Known</b> Application Number: 10/540,112 Filing Date: 12/19/2003 First Named Inventor: Nikhil KORATKAR Art Unit: Unassigned Examiner Name: Unassigned Attorney Docket Number: 047182-0145	
Sheet	1	of	3

U.S. PATENT DOCUMENTS					
Examiner Initials*	Cite No. <sup>1</sup>	Document Number Number-Kind Code <sup>2</sup> (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear

FOREIGN PATENT DOCUMENTS						
Examiner Initials*	Cite No. <sup>1</sup>	Foreign Patent Document Country Code <sup>3</sup> Number <sup>4</sup> Kind Code <sup>5</sup> (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Documents	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T <sup>6</sup>

NON PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No. <sup>1</sup>	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.) date, page(s), volume-issue number(s), publisher, city and/or country where published.	T <sup>6</sup>
	A1	Baughman et al., "Carbon Nanotubes-the Route Toward Applications," Science, August 2, 2002, 297, 787-792.	
	A2	Capone et al., "Gas Sensitivity Measurements on NO <sub>2</sub> Sensors Based on Copper (II) Tetrakis(n-butylaminocarbonyl)phthalocyanine LB Films," Langmuir, 1999, 15, 1748-1753.	
	A3	Chopra et al., "Development of RF Carbon NANotube Resonant Circuit Sensors for Gas Remote Sensing Applications," 2002 IEEE MTT-S Digest, 639-642.	
	A4	Collins et al., "Extreme Oxygen Sensitivity of Electronic Properties of Carbon Nanotubes," Science, March 10, 2000, 287, 1801-1804.	
	A5	Currie et al., "Micromachined thin film solid state electrochemical CO <sub>2</sub> , NO <sub>2</sub> and SO <sub>2</sub> gas sensors," Sensors and Actuators B, 1999, 59, 235-241.	
	A6	deJonge et al., "High brightness electron beam from a multi-walled carbon nanotube," Nature, November 28, 2002, 420, 393-395 and 461.	

Examiner Signature	Date Considered	
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\*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. 1 Applicant's unique citation designation number (optional). 2 See Kinds Codes of USPTO Patent Documents at [www.uspto.gov](http://www.uspto.gov) or MPEP 901.04. 3 Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). 4 For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. 5 Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. 6 Applicant is to place a check mark here if English language Translation is attached. This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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		Filing Date	12/19/2003
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		Art Unit	Unassigned
Sheet 2 of 3		Examiner Name	Unassigned
		Attorney Docket Number	047182-0145

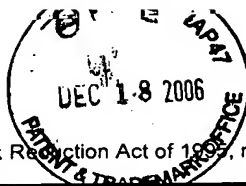
## NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No. <sup>1</sup>	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.) date, page(s), volume-issue number(s), publisher, city and/or country where published.	T <sup>6</sup>
	A7	DETECTORS Flame Ionization Detector – FID, date unknown, company brochure, 8 pages.	
	A8	Dresselhaus et al., "Carbon Nanotubes, Synthesis, Structure, Properties and Applications," 2001, 80, Table of Contents only.	
	A9	Drotar et al., "Reflection high-energy electron diffraction from carbon nanotubes," Physical Review B, 2001, 64, 125417-1 to 125417-6.	
	A10	Dume, Belle, "Nanotubes make miniature gas sensors," physicsweb, July 10, 2003, 2 pgs.	
	A11	Edgecombe et al., "Microscopy and computational modeling to elucidate the enhancement factor for field electron emitters," Journal of Microscopy, February 2001, 203(2), 188-194.	
	A12	Endres et al., "A capacitive CO <sub>2</sub> sensor system with suppression of the humidity interference," Sensors and Actuators B, 1999, 57, 83-87.	
	A13	Forbes et al., "Some comments on models for field enhancement," Ultramicroscopy, 2003, 95, 57-65.	
	A14	Keblinski et al., "Charge Distribution and Stability of Charged Carbon Nanotubes," Phys. Rev. Lett., December 2002, 89(25), 255503-1-255503-4.	
	A15	Kong et al., "Nanotube Molecular Wires as Chemical Sensors," Science, January 28, 2000, 287, 622-625.	
	A16	Koratk, Nikhil, "Carbon Nanotubes as Ionization Detectors for Chemical Sensing," web page visited December 8, 2003, 2 pgs.	
	A17	Lee et al., "A new process for fabricating CO <sub>2</sub> -sensing layers based on BaTiO <sub>3</sub> and additives," Sensors and Actuators B, 2000, 68, 293-299.	
	A18	Li et al., "Study of the self-sustaining discharge gas sensor with carbon nanotube cathode," Joint 15 <sup>th</sup> IVMC and 48 <sup>th</sup> IFES, July 7-11, 2002, 3 pgs.	
	A19	Lonergan et al., "Array-Based Vapor Sensing Using Chemically Sensitive, Carbon Black-Polymer Resistors," Chem. Mater. 1996, 8, 2298-2312.	
	A20	Mandelis et al., "Physics, chemistry and technology of solid state gas sensor devices," Wiley-Interscience, 1993 (table of contents).	

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		<b>Application Number</b>	10/540,112
Sheet 3 of 3		<b>Filing Date</b>	12/19/2003
		<b>First Named Inventor</b>	Nikhil KORATKAR
		<b>Art Unit</b>	Unassigned
		<b>Examiner Name</b>	Unassigned
		<b>Attorney Docket Number</b>	047182-0145

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	A21	Matsubara et al., "A practical capacitive type CO <sub>2</sub> sensor using CeO <sub>2</sub> /BaCO <sub>3</sub> /CuO ceramics," Sensors and Actuators B, 2000, 65, 128-132.	
	A22	McConnell et al., "The Cytosensor Microphysiometer: Biological Applications of Silicon Technology, Science, September 25, 1992, 257, 1906-1912.	
	A23	Miasik et al., "Conducting Polymer Gas Sensors," J. Chem. Soc., Faraday Trans. 1, 1986, 82, 1117-1126.	
	A24	Modi et al., "Miniaturized gas ionization sensors using carbon nanotubes," Nature, July 10, 2003, 424, 171-174 and 2 page Supplementary Section.	
	A25	Ong et al., "A Wireless, Passive Carbon Nanotube-Based Gas Sensor," IEEE Sensors Journal, April 2002, 2(2), pp. 82-88.	
	A26	Peng et al., "Carbon Nanotube Chemical and Mechanical Sensors," Structural Health Monitoring, 2001, 1142-1149.	
	A27	Photoionization detector (PID) HNU, October 6, 1994, US EPA, 1-16.	
	A28	Pinghu et al., "Study of a new gas sensor based on electrical conductance of gases in a high electric field," Chinese Journal of Scientific Instrument, 19(3), 1998, 239-244.	
	A29	Shimizu et al., "Basic aspects and challenges of semiconductor gas sensors," MRS Bull., 24(6), 18-24, 1999.	
	A30	Takao et al., "High ammonia sensitive semiconductor gas sensors with double-layer structure and interface electrodes," J. Electrochem. Soc., 141, 1028-1034, 1994.	
	A31	Wei et al., "Lift-up growth of aligned carbon nanotube patterns," Applied Physics Letters, November 6, 2000, 77(19), 2985-2987.	
	A32	Zhang et al., "Study of Gas Sensor with Carbon Nanotube Film on the Substrate of Porous Silicon," Proc. 14 <sup>th</sup> Intl. Vacuum Microelectron. Conf., august 13-16, 2001, 13-14.	
	A33	Zhang et al., "Substrate-site selective growth of aligned carbon nanotubes," Applied Physics Letters, December 4, 2000, 77(23), 3764-3766.	

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